

Making sense of pool chemistry

This booklet is intended as a basic guide and should be read in conjunction with the manufacturers' instructions.

1. INTRODUCTION

Chlorine is used in a pool to:

- kill harmful micro-organisms
- treat body wastes eg sweat, urine
- stop mosquitoes breeding
- prevent algae growing

A sparkling pool shows that:

- algae have been effectively killed; and
- the reticulation/filtration system is working satisfactorily
- disease causing bacteria and amoebae may still be present in a sparkling pool
 - they can only be seen with a microscope
 - they can only be controlled with chemicals

It is important to monitor the chemistry of the pool to make sure:

- it is safe to swim in
- the chemicals do not harm swimmers
- the chemicals do not damage the pool

This is achieved through chlorination, pH control and may involve the use of stabilisers. *The Code of Practice For The Design, Construction, Operation, Management & Maintenance Of Aquatic Facilities* (Adopted by *Health Act (Aquatic Facilities) Regulations, 2007*) dictate the levels for the above chemical parameters.

2. CHLORINATION

There are few technical terms relating to chlorine which are simplified below:-

- a) **FREE CHLORINE** is "free" to latch onto and break down new wastes in the pool. The normal chlorine test measures this.
- b) **COMBINED AVAILABLE CHLORINE** is already latched onto existing wastes and is poor at breaking down new wastes.
- c) **TOTAL RESIDUAL CHLORINE** is the total of free chlorine and combined available chlorine in the pool.
- d) **MARGINAL CHLORINATION** occurs when most of the chlorine in the pool is in the combined form. A "chlorine" odour results, as there is not enough "free" chlorine to break down the new wastes. A "free" chlorine test will show no chlorine in the pool.
- e) **BREAKPOINT CHLORINATION** occurs when there is more "free" chlorine in the pool than combined chlorine. The "free" chlorine breaks down new wastes. A "free" chlorine test shows chlorine in the pool.
- f) **SUPER CHLORINATION** is carried out when extra chlorine is added to the pool to give a "free" chlorine level of about 5ppm. This is done to overcome pool problems eg:-
 - amoeba found in pool by Health Department
 - algae growing in the pool
 - cloudy pool water due to overuse etc.

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The extra chlorine will slowly decay in sunlight, so swimmers can use the pool when the chlorine level is re-checked and is back to the normal level. (See Chemical Summary Table on page 7).

3. CONTROL OF pH:

a) pH is the measure of the acid or alkalinity of the pool. The pH scale is from 1 (acid) to 14 (alkaline) with 7.0 being neutral pH.

- "Free" chlorine which breaks down bacteria and body wastes and works best at pH 7.2
- The recommended pH range is between pH 7.2 and pH 7.6. Do not exceed pH 7.8.
- Add acid to lower pH; alkaline to raise it.
- At pH 7.6 twice as much chlorine must be added to achieve the same effectiveness as that at pH 7.2.
- Below pH 7.2 the chlorine is acid enough to corrode a pool as well as cause stinging eyes and skin rashes to swimmers.

7.2 7.3 7.4 7.5 7.6 7.7 7.8

RECOMMENDED RANGE

BELOW pH 7.2

TOO ACID

Damages pool

Stings eyes

pH 7.2 - pH 7.6

ABOVE

TOO ALKALINE

Not effective

b) ALKALINITY TESTING as the interpretation of these results is complex, this test can be ignored if the pH is kept between 7.2 and 7.6.

4. STABILISING A POOL

Sunlight breaks down chlorine so stabilisers are used to protect the chlorine from the harmful UV rays of the sun. Stabilisers can be made of neat cyanuric acid or a compound containing cyanuric acid (dichloro-isocyanurate or trichloro-isocyanurate).

- Stabilisers save money in the long run, as not so much chlorine is lost to the sun.
- As stabilisers hold on to the chlorine, keep the "free" chlorine level 1mg/l higher than an unstabilised pool. (See Chemical Summary Table on page 5).
- A stabiliser does not evaporate off - once in the pool; it stays there! It is only lost through excessive splashing or when the pool is emptied.
- If too much stabiliser is added to the water it holds on to all the "free" chlorine leaving none to break down bacteria and body wastes. The pool will then go green! This is called CHLORINE LOCK. The only remedy is to empty most of the water out of the pool and start again.
- Stabilisers should be dispensed slowly over a period of days and are dissolved and dispersed more effectively if introduced near the pool water inlet.
- A separate cyanuric acid testing kit is available from pool suppliers. This test is not normally part of the routine testing kit.
- The optimum cyanuric acid level should be between 30 and 50ppm with a maximum recommended level of 60ppm.

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5. HANDY HINTS

- KEEP A LOG BOOK of daily chlorine pH levels eg 8am, 1pm and 8pm in summer. Record how much of each chemical is added to the pool during evening (and lunchtime) additions.
- ADD CHLORINE AFTER SUNSET: the new chlorine will then be in contact with the bacterial and body wastes for as long as possible before people swim in the pool.
- ADD WATER TO THE POOL VIA THE SKIMMER BOX: the water will then go through the filter before entering the pool. If this is done at sunset then the chlorine will have all night to act on the new water before swimmers enter the pool. This is very important if bore water is used in the pool.
- AMOEBIC MENINGITIS: Amoebae causing meningitis are very active at higher temperatures, so when the pool is above 26°C make sure that there is a little more chlorine in the pool:

	Below 26°C	Above 26°C
Stabilised pool	2ppm CL	3ppm Cl
Unstabilised pool	1ppm Cl	2ppm Cl

- 1 part per million (1ppm) = 1 milligram per litre (1mg/l). 1 cubic metre = 1000 litres.
- READ TEST TUBE STRAIGHT AWAY and do not leave chemicals in tubes for prolonged periods as the tubes stain easily.

6. WHAT TO DO IF ...?

PROBLEM	CAUSE	SOLUTION
GREEN WATER	a) Algae	Adjust pH (will be low) Superchlorinate.
	b) Chlorine lock due to too much stabiliser	Reduce the stabiliser level by emptying out water from the pool
CHLORINE ODOUR	a) Unpleasant smell, swimmers' eyes red	Insufficient chlorine. Superchlorinate.
CLOUDY WATER	a) Early algae growth, Poor filtration	Superchlorinate. Check Filter
	b) High pH	Lower pH with acid

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7. CHEMICAL SUMMARY

According to the *WA Health Act (Swimming Pools) Regulations 1964*, the chlorine, pH and stabiliser levels should be maintained as follows:-

	UNSTABILISED POOL	STABILISED POOL
PH OF WATER	FREE CHLORINE	FREE CHLORINE
7.0 to 7.3	1ppm	2ppm
7.4 to 7.6	1ppm	2.5ppm
7.7 to 7.8	1.5ppm	2.5ppm
CYANURIC ACID: special test kit	Nil.	30 to 50ppm (max 60ppm)

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